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SUBJECT: "Additional Fencing and Radiation Monitoring Required for 5-Mw Operation of the TSR-II"

TO: Distribution

FROM: V. R. Cain

For the future 5-Mw operation of the TSR-II, certain measures will be necessary to insure that the general public is not subjected to radiation doses over recommended limits. Additional fencing will be required as well as rather elaborate monitoring equipment.

If the Melton Hill Dam is built, TVA has agreed to build an AEC-type security fence from the intersection of the TSF access road with the White Wing Road, southerly, easterly, and northerly to the Bethel Valley Road near New Bethel Church (see Fig. 1). It is proposed that the Laboratory construct a fence extending from the western terminus of the TVA fence northerly along White Wing Road to the Whiteoak Dam, thence northeasterly, following the bed of Whiteoak Lake and Melton Branch to the proposed TVA fence. This fence should be of such a type that it could be considered a positive personnel barrier. The cost of AEC-type security fence in this location would be approximately $120,000.

In the event that TVA does not put in the security fence along the river, the Laboratory would be obliged to construct a fence in approximately the same location in order to complete the positive personnel barrier around the TSF. If, in the absence of the dam, trespassing by the general public is considered less likely, 5-ft hog wire fence should be sufficient for most of the fence. Only the section of the fence open to public view, along White Wing Road, would need to be AEC-type security fence. The cost of this entire fence (including steel posts set in concrete throughout) would be approximately $100,000.

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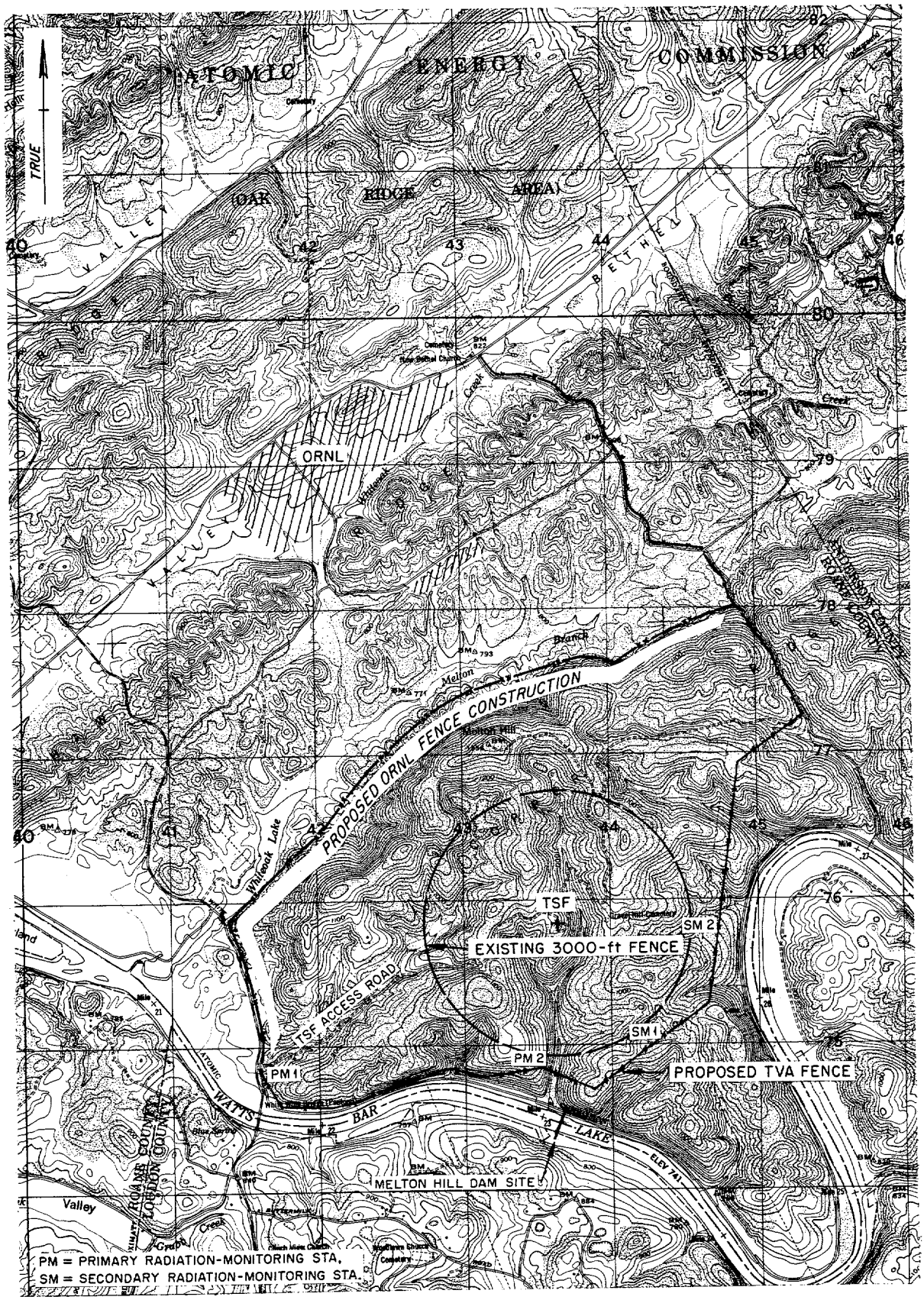

Fig. 1.

Either type of fence should allow removal of the 24-rem per 24-hour day limitation now existing at the present 600-ft fence, thereby permitting more flexibility in the type of experiments the TSF is capable of performing. A vehicle gate in the 600-ft fence would be remotely controlled from the TSF control room, permitting this fence to act as a "last ditch" barrier to the very determined trespasser. The 3,000-ft guard post would be relocated on White Wing Road and the guard would remain at this post at all times. Stationing the guard at the White Wing Road will eliminate the necessity of installing a positive personnel barrier along both sides of the 1.7-mi access road to the facility.

In regard to the radiation monitoring at the proposed fence, it should be noted that the point of closest approach from the TSF to the White Oak Lake-bed fence is over 5,500 ft. That distance is sufficient to render it unnecessary to monitor the radiation at that point. Figure 2 shows an isodose plot, derived from experimental measurements, for a highly collimated beam directed away from the Melton Hill Dam area.[1] It can be seen from this plot that a point directly in line with the beam and at 4500 ft receives the same dose as a point 180° from the beam at 3300 ft. Therefore, a radiation monitor at approximately 3300 ft from the TSF would receive as much as or more radiation than any point at least 4500 ft. distant. Radiation monitors at the locations indicated on Fig. 1 should give sufficient indication to insure that no points outside the fence receive more than civilian tolerance.

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1. V. R. Cain, Prediction of Radiation Intensities at Large Distances from the TSR-II, ORNL-CF-59-3-58 (1959).

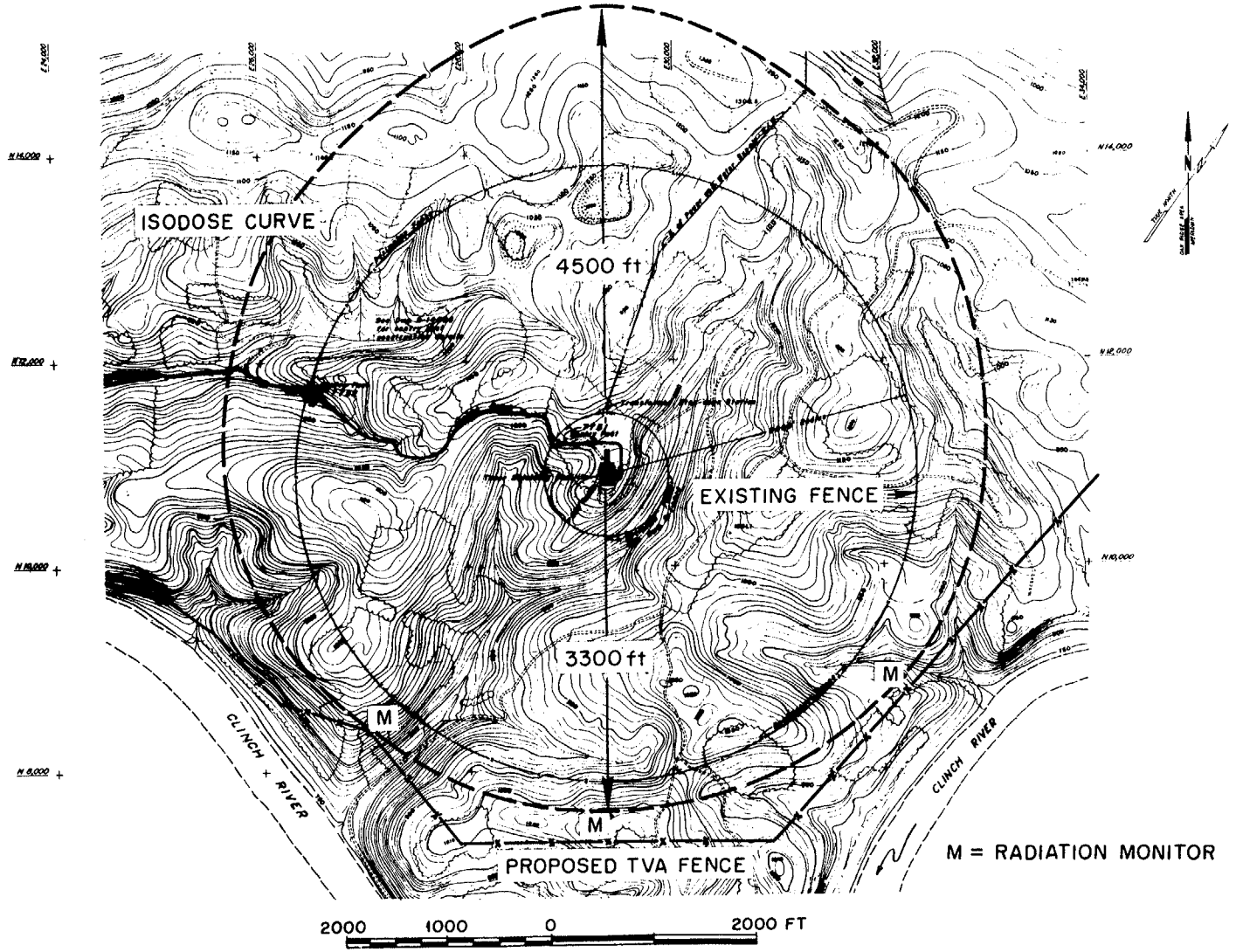

Fig. 2. Isodose Plot.

Monitoring equipment at these locations must be capable of measuring dose-rate levels as low as 0.25 mrem/hr from both fast neutrons and gamma rays (civilian tolerance of 500 mrem/year on the basis of a 40-hr work week). This requires rather elaborate equipment which is not too well suited to use in this rugged terrain.

It is proposed that two primary monitoring stations, each constructed on a small, mobile, camp trailer, be employed. The equipment of each of the primary stations will include one fast-neutron dosimeter, one graphite-wall CO_2 ion chamber, and one GM counter, with provision both for on-site recording and for telemetering data to the TSF underground building. Power for instrument operation will be supplied either by included gasoline generators or by connection to available external power sources.

The first of these mobile primary stations will normally be maintained at the White Wing Road terminus of the TSF access road. The second will be located in the vicinity of the dam area. Two auxiliary monitoring stations, equipped only with GM counters, will be located at the two points of closest approach of the TVA fence to the TSF, both east of the dam site, and connected with the second primary station. Locations of all stations are indicated on Fig. 1. Mobility of the primary stations will permit investigation at other points if required.

Although the secondary stations will monitor only gamma-ray dose, estimation of fast-neutron dose rates should be possible by comparison with primary station data, since at the distances considered the neutron-to-gamma-ray ratio is not expected to vary rapidly with azimuth.

The detectors and associated electronics required for the monitoring stations are commercially available, thus no development problem is involved. Transmitting the data obtained from the four stations to the TSF will be only a minor developmental task.

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